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June 19, 1997

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JUN 19 1997
Federal Communications Commission
Office of Secretary

Mr. William F. Caton
Acting Secretary
Federal Communications Commission
1919 M Street, N.W. Room 222
Washington, D.C. 20554

RE: In the Matter of Federal-State Joint Board on Universal Service - CC Docket No. 96-45

Dear Mr. Caton,

Yesterday, representatives of Sprint and U S WEST met with Mr. Ken Moran of the Common Carrier Bureau's Accounting and Audits Division to discuss cost proxy models in the above referenced proceeding. Representing Sprint were Mr. John Banks, Dr. Brian Staihr, and the undersigned. Representing U S WEST was Mr. Glenn Brown.

The attached information was used during the meeting. Sprint and U S WEST request that this information be made a part of the record in this matter. Two copies of this letter, in accordance with Section 1.1206(a)(1), is provided for this purpose. The meeting ended after 5:15 p.m. on June 18, therefore, this notice is provided today. If there are any questions, please feel free to call.

Sincerely,

Warren D. Hannah

Warren D. Hannah

Attachments

c: Attendees

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List ABCDE

Benchmark Cost Proxy Model 2

Assumptions: Loop Technology

- Distribution Plant - Analog Copper Technology
  - Fiber
- Analog Copper Feeder Where Loop Length Is User Selectable Input: 6,000; 9,000; 12,000; 15,000; 18,000
- Fiber Feeder For Digital Subscriber Line Carrier Where Loop Length >User Set Maximum
  - Remote Terminal At Feeder Plant End - At or in the CBG
- Two Types of Digital Loop Carrier Systems
  - Large Digital Loop Carrier (DLC-L) for Terminals Needing Capacity > 240 Lines
  - Small Digital Loop Carrier (DLC-S) for Terminals Needing Capacity < = 240 Lines
  - Both Products Utilized in Drop/Add Configurations With DLC-L Having Total Capacity of 2016 VG Channels Per 4 Fibers and DLC-S Have Total Capacity of 672 VG Channels Per 4 Fibers

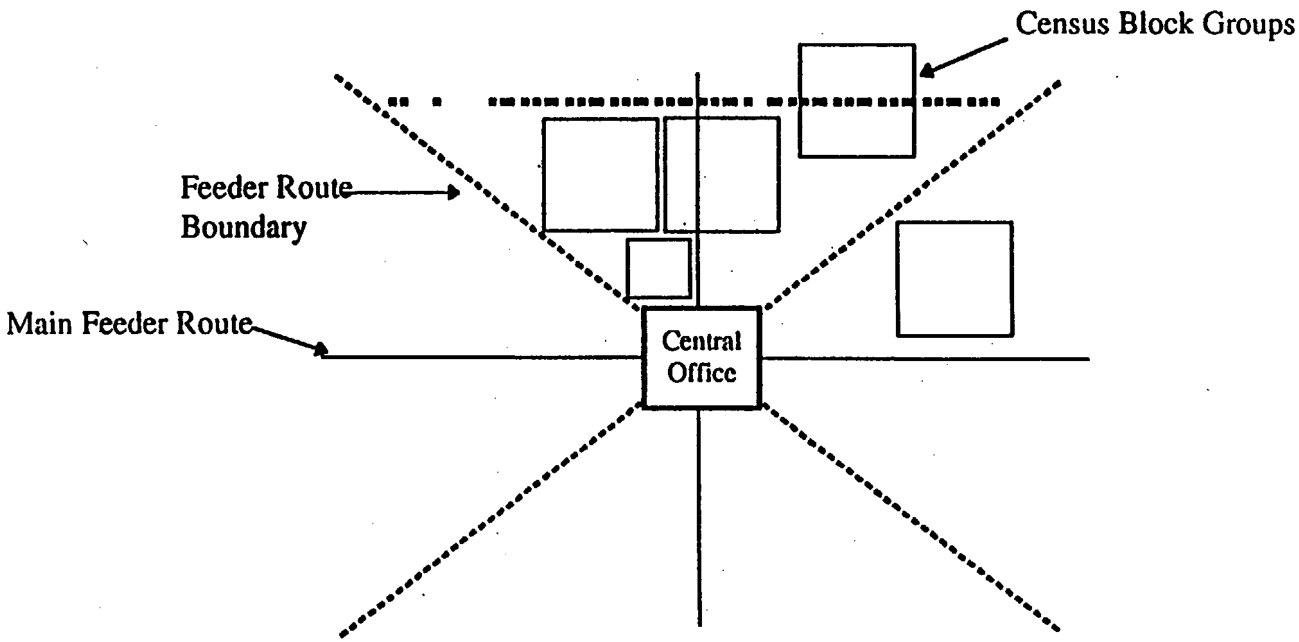
Benchmark Cost Proxy Model 2

Assumptions: Feeder Plant Architecture

- Feeder Cable Begins at CO and Extends to the Appropriate Interface Point Within the CBG
- 4 Main Feeder Routes Leave CO With Feeder Route Boundaries at 45º Angle From Main Route
- Cable and Fiber Feeder Systems Share Structure in Main Feeder Systems
- Main Feeder Routes Are Segmented at Taper Points
- Each Feeder segments Cable Size Determined by Segment Capacity
- Feeder Cable Size From 25 Pair to 4200 Pair, Fiber Cable Size From 12 Strand to 288 Strand

Benchmark Cost Proxy Model 2

Feeder Plant



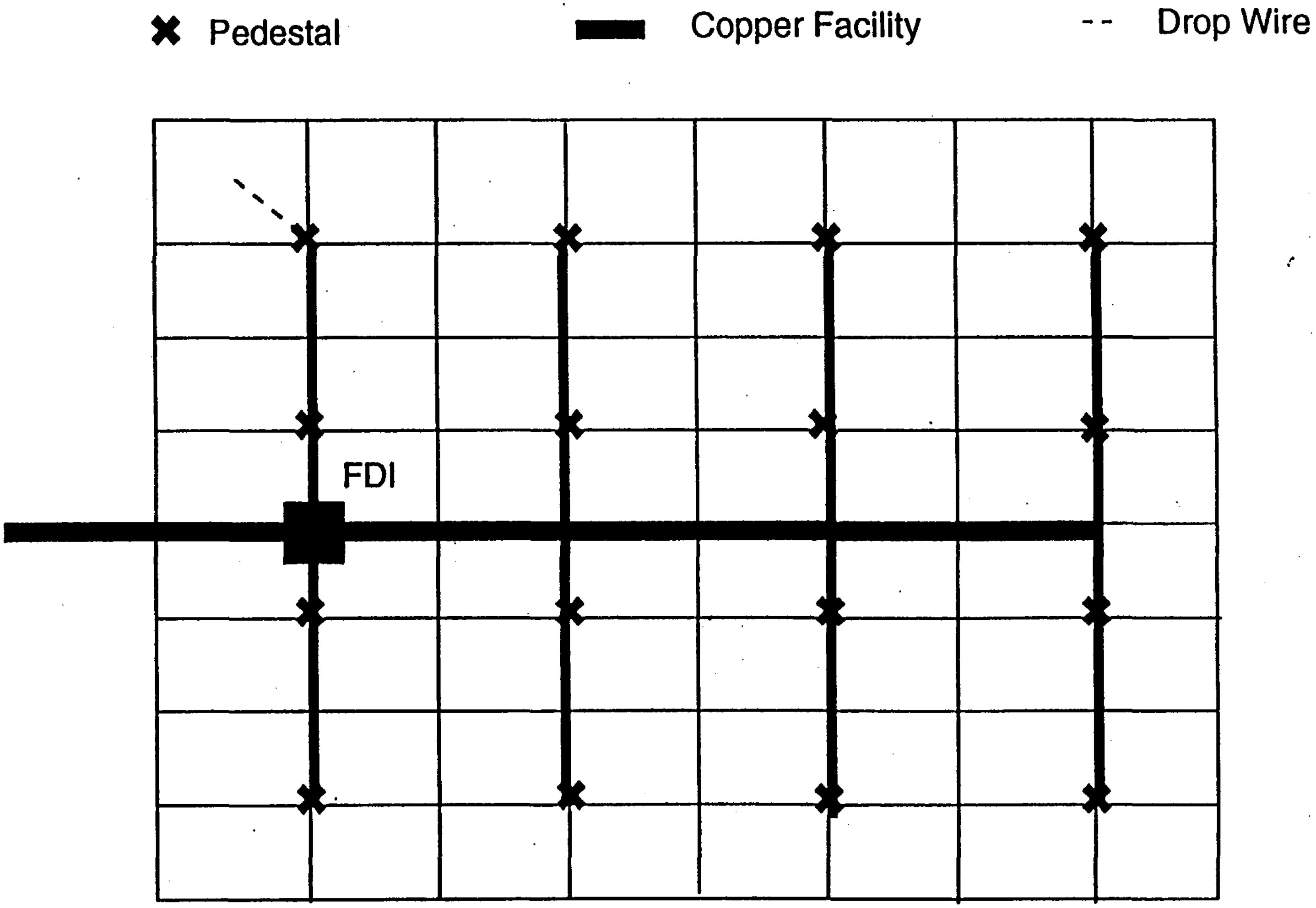
Benchmark Cost Proxy Model 2

Assumptions: Distribution Plant Architecture

- Households Are Evenly Distributed in CBG (Except in Sparsely populated CBGs)
- Distribution Cable Begins at Feeder Distribution Interface and Ends at Customer Premises
- Distribution Plant Designed to Reach All Households in CBG Through Placing of Cables Between Subdivision Lot Lines
- Copper Distribution Length Limited at User Adjustable Maximum
- Distribution Cable Size From 12 Pair to 3600 Pair
- Percentage of Business Lines Terminated at DS1 Level Signal (User Adjustable Input)
- Fiber Utilized Below Copper Distance Breakpoint in CBGs Where Line Demand Exceeds Maximum Copper Cable Size

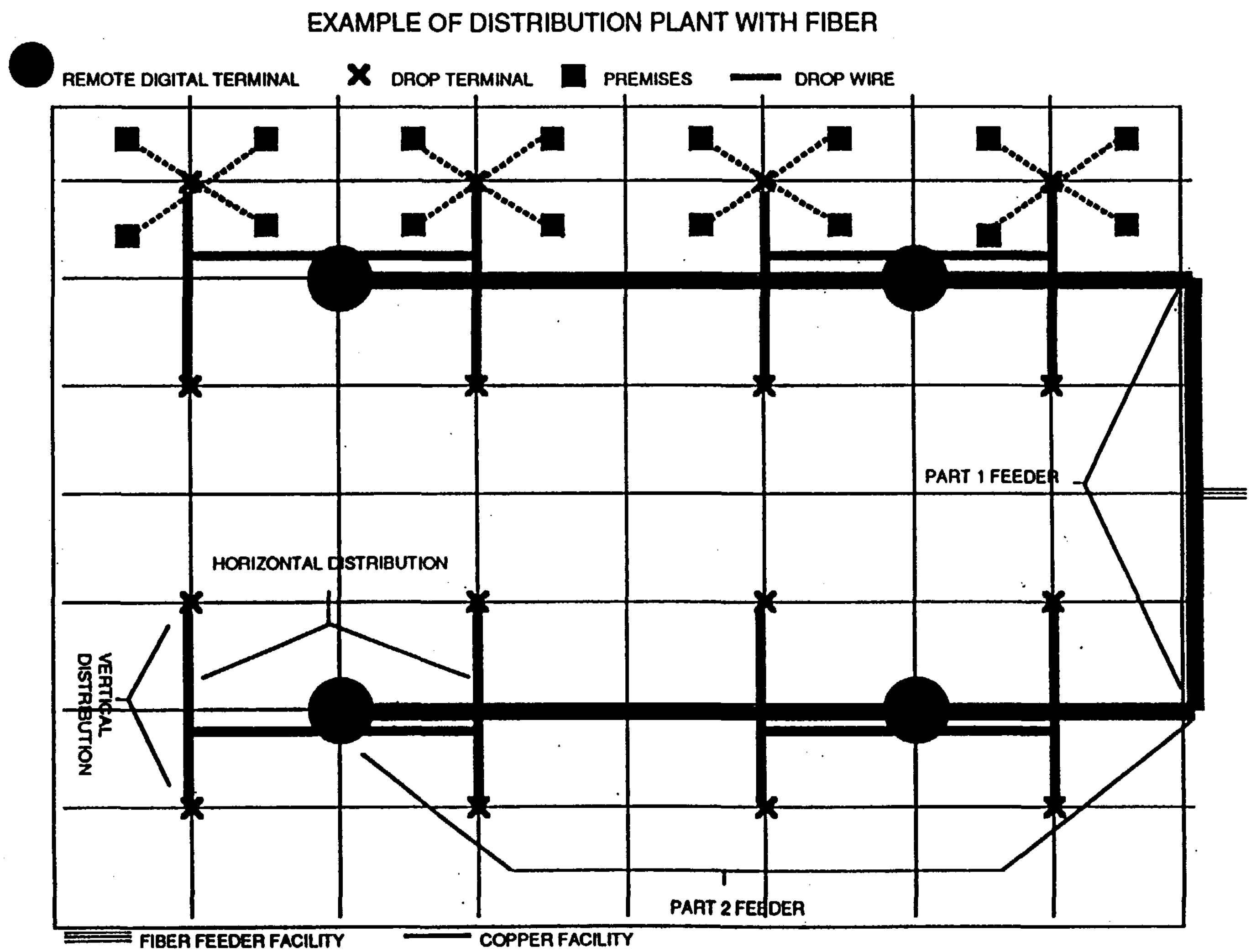
Benchmark Cost Proxy Model 2

Distribution Plant with Copper



Sprint & U S WEST

Benchmark Cost Proxy Model 2



Benchmark Cost Proxy Model 2

Assumptions: Density

- Density of Existing Population Determines the Construction Methods Used in Deploying Telephone Plant.
- Density of Population Determines Potential for Growth and the Future Need for Additional Capacity.
- Density of Population Influences the Mix of Underground, Buried and Aerial Plant.

Benchmark Cost Proxy Model 2

Assumptions: Terrain Placement Costs

- Placement Depths For Copper 24"; For Fiber 36" - User Adjustable Input
- Terrain Indicators Include: (Source: U.S.D.A./S.C.S.)
  - Depth to Water Table
  - Depth to Bedrock
  - Hardness of Bedrock
  - Surface Soil Texture
- Critical Water Table Depth 36" - User Adjustable
- If Water Table or Bedrock Within Placement Depth, Then Structure Costs Reflect Additional Construction
- Otherwise, Surface Texture Examined For Plowing Difficulty

Benchmark Cost Proxy Model 2

Assumptions: Fill Factors

Density	Feeder	Distribution
0 to 10	75%	40%
10 to 50	80%	45%
50 to 150	80%	55%
150 to 500	85%	65%
500 to 2000	85%	75%
2000 to 5000	85%	80%
5000 plus	85%	80%

Benchmark Cost Proxy Model 2

Example of Structure Inputs

	Cost per Unit	% of Activity	% Assigned Telephone	Weighted Amount	% of Activity	% Assigned Telephone	Weighted Amount
Trench & Backfill	$ 2.69	67.00%	95.00%	$ 1.52	79.00%	80.00%	$ 1.79
Rocky Trench	$ 4.83	0.00%	95.00%	$ -	0.00%	80.00%	$ -
Backhoe Trench	$ 3.38	17.00%	95.00%	$ 0.46	5.00%	80.00%	$ 0.14
Hand Dig Trench	$ 6.00	2.00%	95.00%	$ 0.10	2.00%	80.00%	$ 0.10
Boring	$ 13.26	2.00%	95.00%	$ 0.24	2.00%	80.00%	$ 0.24
Cut & Restore Asphalt	$ 9.45	5.00%	95.00%	$ 0.44	5.00%	80.00%	$ 0.44
Cut & Restore Concrete	$ 10.30	5.00%	95.00%	$ 0.48	5.00%	80.00%	$ 0.48
Cut & Restore Sod	$ 4.41	2.00%	95.00%	$ 0.08	2.00%	100.00%	$ 0.08
Total Underground Cost per Foot		100.00%		$3.31	100.00%		$3.26

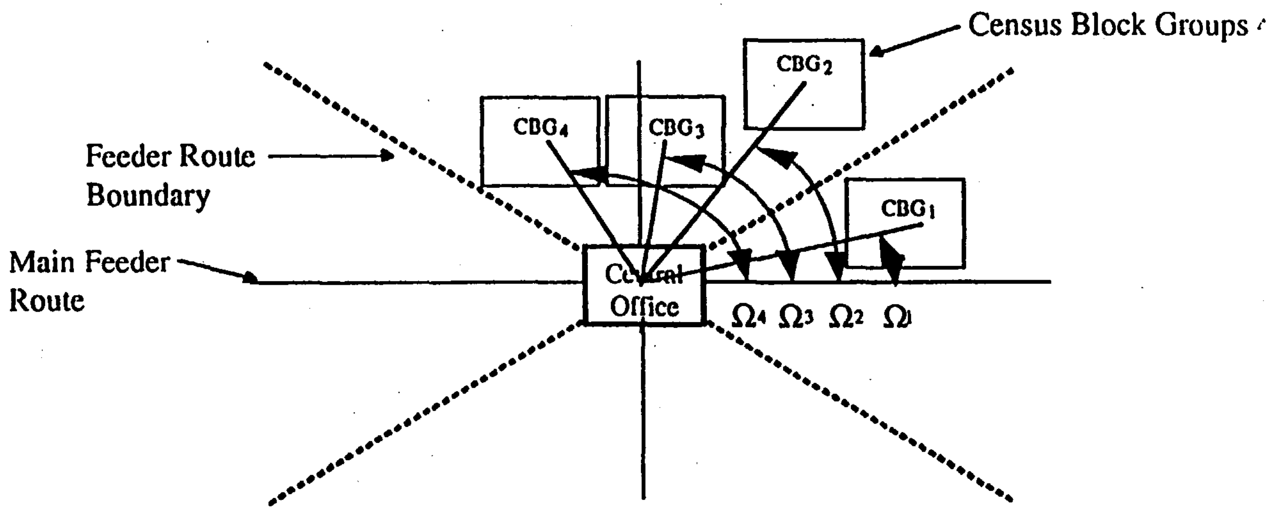
Benchmark Cost Proxy Model 2

Feeder & Distribution Plant Distance

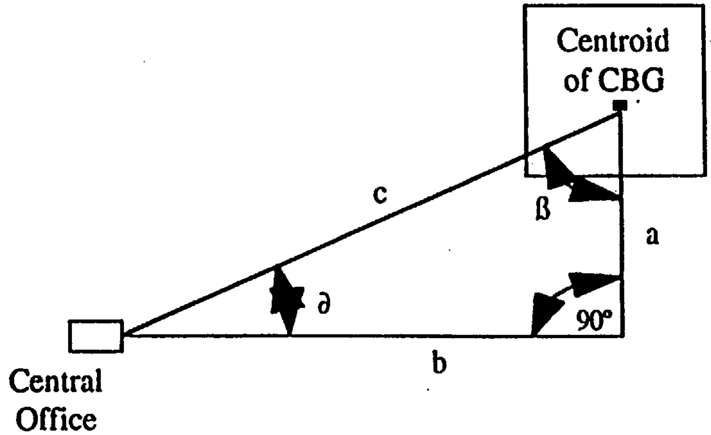
- Determination of Quadrant for Feeder Plant
- Utilizes Tree and Branch Topology
- SCS Slope Measurements Trigger Distance Adjustments
- Distribution Plant Calculations Based on Size of CBGs After Using Road Network to Reduce Size to Populated CBG Area

Benchmark Cost Proxy Model 2

Determination of Feeder Quadrant

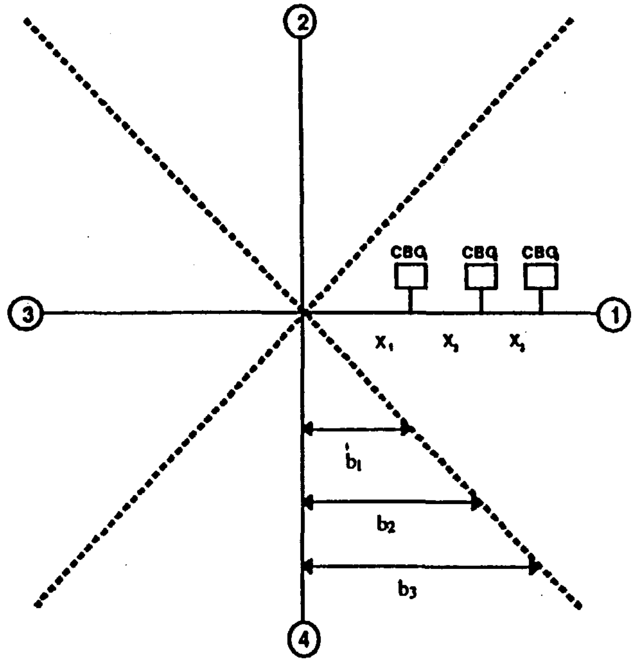


Feeder Distance Calculation



Benchmark Cost Proxy Model 2

Shared Feeder Distance Calculation



Feeder & Distribution Cable Size

- Each Feeder Segment Cable Size Determined From Segment Capacity
- If Max Size Cable < Pairs Required, Then 1 or More Max Size Cables Plus a Residual Cable Sized to Meet or Exceed Capacity
- Fiber Cable Table (# Strands)

  12, 18, 24, 36, 48, 60, 72, 96, 144, 288
- Copper Cable Table (# Pairs)

  (12 Dist. Only), 25, 50, 100, 200, 400, 600, 900, 1200, 1800, 2400, 3000, 3600, (4200 Feeder Only).

Benchmark Cost Proxy Model 2

Cable Capacity for Shared Feeder Plant

- **Copper**
  - Sum of Lines Riding Feeder Segment/Segment Fill Factor
- **Fiber For DLC-L (4 Fibers Until Capacity Is Exceeded)**
  - 4 Fibers For Capacity Up to 2016 VG Paths
  - 4 Additional Fibers For Each Increment of 2016 VG Path
- **Fiber For DLC-S (4 Fibers Until Capacity Is Exceeded)**
  - 4 Fibers For Capacity Up to 672 VG Paths
  - 4 Additional Fibers For Each Increment of 672 VG Paths

Feeder Segment and Distribution Cable Costs

- Feeder Segment Cost = Segment Distance * Cable Cost Per Foot
- Distribution Cable Cost = Horizontal Distribution Plant Distance * Horizontal Distribution Leg Cost Per Foot * Number of Distribution Legs + Vertical Distribution Plant Distance * Vertical Distribution Leg Cost Per Foot * Number of Vertical Distribution Legs

Benchmark Cost Proxy Model

Model Methodology

Presented by:
Pacific Bell, Sprint, and USWest

Benchmark Cost Proxy Model Methodology

Background

During the Joint Board proceeding in CC Docket 96-45, Sprint and U S WEST sponsored the Benchmark Cost Model 2, and Pacific Telesis sponsored the Cost Proxy Model. Both of these models were excellent models which developed the overall cost of providing basic universal service. Although the two models approached the development of network costs from a totally different perspective, the bottom line results of the models came out surprisingly similar. As a result of this similarity, and in an effort to develop a consensus around a final proxy model for purposes of the targeted high cost fund scheduled to be implemented January 1, 1998, the three companies have combined their talents and energy to develop a superior model which incorporates the best aspects of both models. We call this model the Benchmark Cost Proxy Model (BCPM). (Over time this new model has also been referred to as the "Best of Both" or "Best of Breed", or more simply as "BOB" .)

The BCPM is a combination and improvement of the best attributes of both the BCM2 and the CPM. The BCM2 is well recognized for its dynamic building of the network. The CPM is heralded for its fine unit of geography (the "Grid"), its assignment of households to serving wire centers, and its flexible and dynamic reporting interface. The BCPM takes all of these attributes and adds some exciting new ones (expanded engineering inputs, capital cost module, etc..).

Highlights of the BCPM include:
* A new forward-looking capital cost model which allows the user to easily modify all factors relating to cost of capital and economic depreciation.
* Forward-looking investment and expense factors based upon data from a broad industry base reflecting the cost of procuring, installing and operating a state-of-the-art voice grade telecommunications network.
* All factors are easily user adjustable.
* Clear and concise documentation of all model equations and algorithms as well as complete documentation of the source of all default input variables.
* Greatly enhanced speed and ease of operation, including the ability the change program inputs either through easy to use drop-down menus or direct access to the EXCEL spreadsheets.
* The BCPM model provides methods to process multiple investment and expense views across multiple states. This provides the user with a great deal of flexibility in performing multiple scenario analysis.
* The BCPM allows the computation of forward-looking cost for unbundled network elements (available Phase 2).

The BCM2 used as its fundamental unit of study the census block group (CBG), while the CPM used the much smaller "grid cell". Incorporation of the grid cell data and/or the Census Block into the dynamic design process of the BCPM is scheduled for phase 2 of the release. In the current release, the BCPM is using CBG data.

Introduction

The ability to understand and make explicit the cost of Universal Service is crucial as telecommunication companies approach a critical junction in time. The secure world of highly regulated marketplaces has given way to impending competition. As competition becomes commonplace and regulation changes to allow greater marketplace flexibility, the current structure of funding Universal Service through a complex set of implicit cross subsidies is rapidly becoming obsolete. A new paradigm is needed to successfully fund Universal Service in the competitive environment. This new paradigm is compelled by the passage of the Telecommunications Act of 1996 and the Joint Board proceeding in CC Docket 96-45.

However, to properly set up this new Universal Service paradigm, the cost of basic telecommunication service needs to be determined for all customers. This cost should represent the cost of service that could be provided in the most efficient/cost effective manner. This cost would then be compared to the matching revenue (related to Universal service only) received or a benchmark rate to determine the amount of funding that is required for that customer. If this funding is calculated too low, it would unjustly harm serving LECs, discourage marketplace entry by CLEC's, and ultimately risk the provision of current and future technology too high cost customers. Conversely, if the fund is calculated to high, it would provide an unwarranted windfall to LECs and encourage inefficient market entry by CLECs.

However, it is not practical to determine the actual cost of every customer. Therefore, a method to approximate the actual costs of providing service in an economically sound manner while incorporating current and expected sound engineering practices had to be developed. The BCPM is such a tool.

The purpose of the BCPM is to estimate benchmark costs for providing business and residential basic local telephone service nationwide. Small geographic areas are examined because the cost of providing basic telephone service varies greatly even within the geographic unit of the wire center. The model can identify specific areas which are high cost to serve because of the physical characteristics of the area.

BCPM assumes all plant is placed at a single point in time. All facilities are created as if the entire country is a new service area. Therefore, the BCPM reflects the costs a telephone engineer faces installing new service to existing population centers.

BCPM is a geographically-based high level engineering model of a hypothetical local network. In phase 1, the geographic units used by the model are Census Block Groups (CBGs) designated by the U.S. Bureau of the Census. There are over 226,000 CBGs covering the entire U.S.[1] In phase 2, the BCPM will utilize a combination of CBGs and census blocks, a sub-unit of the CBG. The model utilizes a number of data elements for each of the geographic units it analyzes:

1) The geographic boundaries of the CBG as defined by the Census Bureau.
2) The geographic center (centroid) of the CBG.
3) The number of households in the CBG using the 1995 Census Bureau estimates. This data is used in conjunction with residential line counts by state from industry reports.
4) Terrain information from the U.S. Geologic Survey (U.S.G.S.) and Soil Conservation Service, which includes water table depth, depth to bedrock, hardness of the bedrock, surface soil texture, and slope.
5) Estimate of the number of business lines. This number is developed based on a Dunn and Bradstreet database of employees by CBG and industry reports of business lines by state.

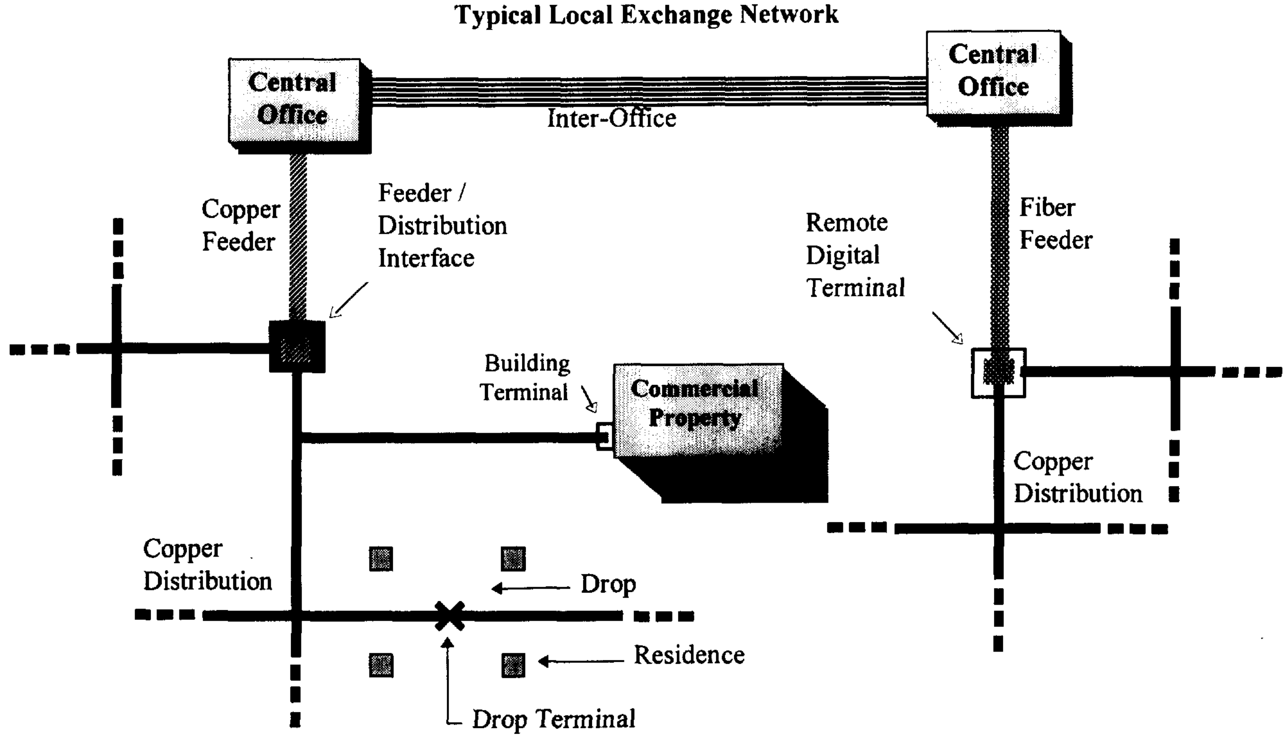
The model starts with the existing central office locations and boundaries throughout the country, identified with Ontarget's Exchange Info data product. This data is input into a geographic information system where each CBG is associated with its serving central office based upon the location of the centroid of the CBG. Next, this information plus the relative physical locations and CBG information are input into the model. With this information BCPM designs a local exchange network utilizing a tree and branch topology.

[1] BCPM is capable of using any small geographic unit. Phase 2 of BCPM will utilize a combination of Census Block Groups and Census Blocks to better locate customer locations within sparsely populated rural areas.

Description of Local Exchange Network

The following figure depicts the elements of a typical local exchange network:

Typical Local Exchange Network



The public voice grade local exchange network is designed to provide an instantly available (under most circumstances) 3,500 Hertz telecommunications channel between any pair of users attached to the network. Components of the network are designed to meet minimum transmission characteristics for noise, echo return loss, envelope delay distortion, as well other quantifiable objectives for transmission quality. Many of these minimum transmission standards are met through basic engineering design criteria that specify the standard electrical and transmission characteristics for individual network components and groups of components. The following description traces a call on the public voice grade network from an originating customer premise through the network to terminate the call at a second customer premise.

Before a call can be initiated, a customer must have telephone set which is connected to the public voice grade network. The customer's telephone plugs into the wall to wiring also owned by the customer. The wiring in each residence and business premise is connected to the network through a telephone company owned interface device located at the customers premise. Single family housing units generally use a basic network interface device (a small gray box located on the outside of the house), while a large commercial building will have a building terminal designed to accommodate terminations for multiple customers. These interface devices connect the public voice grade telephone network to the customer-owned wiring and telephone sets.

Once the customer lifts the phone receiver call connection to the public telephone network begins. At the point the receiver is lifted a connection is made to the telephone company switch at the central office. This connection starts at the telephone set, through the inside wire, through the network interface device which connects to a drop wire. The drop wire consists of two or three pairs of copper wires which permanently connect the house to a drop terminal. In densely populated areas the drop wires from several residences will meet at a drop terminal. The drop terminal is where the drop wires are connected to a larger cable that connects many houses in a similar manner. This cable is called a distribution cable. The distribution cable then connects to a feeder/distribution interface, commonly called an FDI. The FDI connects many distribution cables to a feeder cable. The feeder cable goes to the central office location where it is connected to the telephone switch through a main distribution frame.

The connection to the switch is initiated by the customer lifting the phone receiver. The switch, which is really a large computer, acknowledges the customer action by providing dial tone to the customer, thereby notifying the customer that the switch is ready to receive the telephone number of the party where the call is to be completed. The customer enters the number by "dialing" through the telephone set. The switch interprets the tones or pulses into a terminating location on the network. The switch "looks up" the terminating location in a data base which tells the switch where to physically route the call. In this case the call is connected to a local inter-office trunk group that connects one central office location to another central office in the local calling area. Call traffic is consolidated and switched at telephone company central offices, which are connected with each other via high capacity trunks (usually optical fiber).

At the terminating switch, the terminating call number is translated to a customer location. The terminating switch generates a ringing signal to the terminating location. In this case, the signal follows a path in the switch to a digital channel of a fiber optic feeder route to a remote terminal. At the remote terminal the optical channel signal is converted into a digital electrical signal, and then converted to an analog electrical signal on the pair of copper wires that connects through a FDI, distribution cables, terminals, drop wire, and NID at the terminating location. The phone at the receiving location rings, at which point the receiving party my pick up its phone, completing the call.

Technical Capabilities of BCPM Network

BCPM designs a voice grade network using state-of-the-art technology that is currently available for deployment. The BCPM's default values and parameters provide a network capable of providing basic single-party voice grade service that allows customers to utilize currently available data modems for dial-up access. The BCPM designs the network to eliminate problems associated with providing voice grade service over loaded loop plant.

In order to provided adequate transmission capabilities for fax and dial-up modems, BCPM sets maximum loop lengths for copper at 12,000 feet for both feeder and distribution eliminates problems arising from loading and resistance. In addition to the 12,000 foot copper to fiber breakpoint, the BCPM uses 26 gauge in the feeder and 26/24 gauge in the distribution. 12,000 ft of 26 gauge copper has a resistance value of 999.6 ohms (83.3 ohms per thousand feet @ 68deg.), well within the 1500 ohm supervisory limit of today's digital switches. The 26/24 gauging used in the distribution takes into account the 900 ohm powering limitations of DLC line cards, without going to the considerably more expensive extended range line cards.

The 12,000 foot breakpoint, along with a loop network design that avoids bridged-tap, also removes capacitance concerns. Avoiding bridged-tap is accomplished by tapering and placing feeder-distribution interfaces (FDIs). The 12,000 foot breakpoint also facilitates the provisioning of services up to DS1. Additionally, the BCPM uses digital loop carrier systems for voice grade services rather than analog copper facilities when demand within a CBG is exceeds the capacity of copper cables.

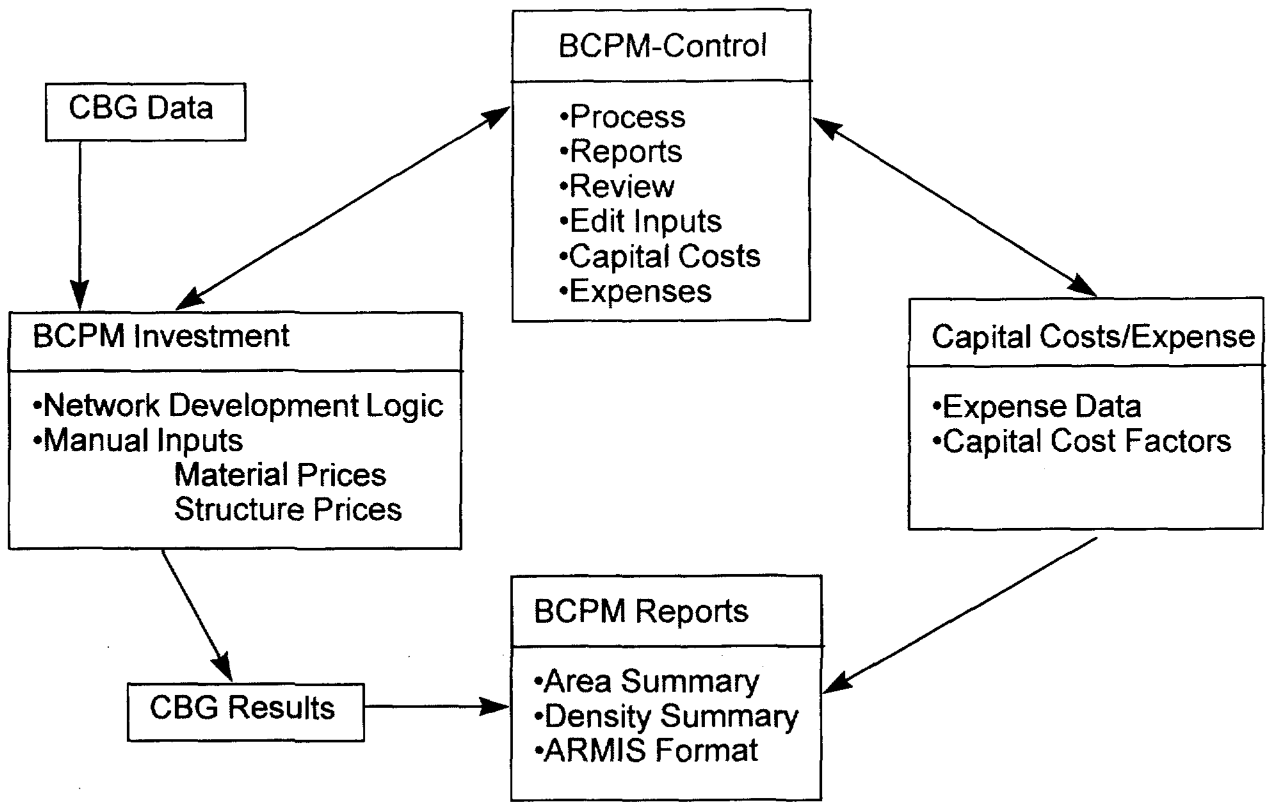
Cable fills that are found in the BCPM tables allow for proper network design. These cable fills allow maintenance operations to cost-effectively deal with defective pairs and administer customer turnover. The default values take into account that a new network is constructed to serve existing households (a snapshot view) with limited excess capacity for growth.

BCPM Process and Methodology

The BCPM operates as an Excel Workbook. The model consists of a number of modules controlled by the user interface or control module. The control module three modules:

1) Investment Module, where network investments are calculated
2) Capital Cost Module, where capital cost factors and expenses are calculated
3) Reports Module, where CBG, CLLI, state, or company reports are produced

The system flow is shown in the diagram below:



The BCPM methodology is presented in the following sections:

- Assumptions for Loop Technology
- Assumptions for Feeder Plant Architecture
- Assumptions for Distribution Plant Architecture
- Assumptions for Switch Technology
- Assumptions for Density
- Algorithms to Develop Basic Local Service Costs
- User Adjustable Inputs

Prior to addressing BCPM methodology a brief description of the incorporation of CPM characteristics and other major model changes from the BCM2 is provided.

Major Changes From BCM2 and CPM to BCPM

Based upon the work of the Best of Breed (BOB) industry group, public comments, technical analyses of the BCM2 and CPM, and comments made by the Joint Board, the best attributes of the CPM and BCM2 and other enhancements have been incorporated into the BCM2's base platform to more clearly present the actual engineering practices in the development of a local exchange network. BCPM includes *all* the costs of basic local telephone service and provides cost results by CBG, as well as higher geographic levels of aggregation.

BCPM differs from the BCM2 in two major areas. The first area of difference is that BCPM utilizes different inputs than the BCM2 and the second area of difference is that the structure of the model has been changed to provide more clarity to the user concerning the use of input areas and the purpose of calculations. Each of these areas is explained in more detail below.

Input Changes

The BOB industry group has provided the BCPM with an industry-wide composite of material, installation, and structure prices currently charged to a wide range of Local Exchange Carriers (LECs) for individual network components. This includes the prices for cables, digital loop carrier equipment, switches, feeder/distribution interfaces, manholes, poles, etc. This change allows the BCPM to use the widest possible base of data of equipment and installation prices currently paid by LECs. This aligns the BCPM with the Joint Board's Principle 1.

Additionally, the BOB group has provided an industry-wide composite of forward-looking operational and overhead expenses by account that are specifically associated with the provision of basic local exchange service. A new expense module allows these forward-looking operational expenses, which are stated on a per line basis, to be adjusted by the user by individual account. The BOB group also developed industry-wide forward-looking cost of capital and depreciation lives by account. These are used in the BCPM's new capital cost module and are fully user adjustable. This aligns the BCPM with the Joint Board's Principle 3 and Principle 4 which state that only forward-looking costs, including cost of capital and depreciation should be used in a proxy model. Additionally, this aligns the BCPM with the Joint Board's Principle 6 which provides for a reasonable allocation of joint and common cost for the supported service.

A final input area that is different from the BCM2 is the assignment of CBGs to wire center. Utilizing the CPM methodology, the BCPM utilizes an assignment of the CBG to the serving wire center, rather than the closest wire center. This assignment is based upon the location of the centroid of the CBG in relation to the wire center boundary obtained from Ontarget's Exchange Info. In Phase 2 of the BCPM, census blocks will be assigned to the serving wire center, providing even more precise network assignments of geographic areas. This aligns the BCPM with the Joint Board's Principle 1 which states that the proxy model will use the incumbent LEC's wire centers as the center of the loop network.

Model Structure

The BCPM provides a reorganization of elements of BCM2 and incorporates elements of CPM to provide a more user-friendly environment. This includes reorganizing inputs into functional categories, as well as creating separate modules for investment development, expense development, and capital cost development. Additionally, report generators are available that can provide detailed reports by CBG (or census block in Phase 2), wire center, company, or state.

The BCPM investment module develops investments for the feeder and distribution portions of the local loop and specifically identifies underground, buried, and aerial investments by metallic and non-metallic plant. Additionally the BCPM identifies the investments in conduit and pole accounts, so that each plant account can utilize its specific depreciation life in the development of depreciation expenses and capital costs. Other investment accounts are also individually quantified.

The BCPM provides an integrated module to develop structure costs for aerial, buried and underground installations by density group and terrain difficulty. This allows the user to individually vary cost of installation activities, such as plowing, as well as vary the percentage of a construction activity by density zone. Additionally, the user can vary the amount of an activity that can be shared between utilities, such as the placing of poles.

The BCPM provides new expense and capital cost modules that provide the user the ability to input USOAR account detail for operation and common expenses as well as giving the capability to adjust account specific depreciation lives, salvage values and cost of removal.

The BCPM organizes various plant characteristics by the seven density groups used in the CPM. This provides a better alignment of density-based network characteristics and costs. Additionally, BCPM recognizes the mix of single family and multi-family housing units, by density group in developing distribution plant, drop cost, NID cost, and terminal cost.